

## CHARGED PARTICLE BEAM DETECTION SYSTEM

### Abstract of the Disclosure

A charged particle beam detection system that includes a Faraday cup detector array (FCDA) for position-sensitive charged particle beam detection is described. The  
5 FCDA is combined with an electronic multiplexing unit (MUX) that allows collecting and integrating the charge deposited in the array, and simultaneously reading out the same. The duty cycle for collecting the ions is greater than 98%. This multiplexing is achieved by collecting the charge with a large number of small and electronically decoupled Faraday cups. Because Faraday cups collect the charge independent of  
10 their charge state, each cup is both a collector and an integrator. The ability of the Faraday cup to integrate the charge, in combination with the electronic multiplexing unit, which reads out and empties the cups quickly compared to the charge integration time, provides the almost perfect duty cycle for this position-sensitive charged particle detector. The device measures further absolute ion currents, has a wide dynamic  
15 range from 1.7 pA to 1.2  $\mu$ A with a crosstalk of less than 750:1. The integration of the electronic multiplexing unit with the FCDA further allows reducing the number of feedthroughs that are needed to operate the detector.